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Maine Agricultural Experiment Station

BULLETIN No. 109. DECEMBER, 1904.

APPLE MAGGOT AND OTHER INSECTS.

This bulletin contains notes upon the Apple Maggot with preventive and remedial measures; and the insects sent to the Station for identification in 1904.

Requests for bulletins should be addressed to the
Agricultural Experiment Station,
Orono, Maine.

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THE APPLE MAGGOT (*Rhagoletis pomonella.*)

EDITH M. PATCH AND W. M. MUNSON.

In acknowledgement of, if not in answer to, the appeals for help against the apple maggot, a consideration of this insect seems again to be due. The life history of the apple maggot is well enough ascertained so that the fight against it can be intelligently carried on; and an attempt has been made in this paper simply to bring together such known facts in the life of the pest as have a bearing on the means of combating it. The statements are based in the main upon the investigations recorded in the Monograph on The Apple Maggot (1888-1889) by the late Professor F. L. Harvey.* Independent observations of the advanced larval and early pupal stages have been made, but inasmuch as they serve merely to confirm what has already been done, they are for the most part suppressed.

It has not seemed necessary to restate the detailed work which led to a knowledge of the facts here given. Fifteen years have not brought about any apparent change in the insect. When it was first described for Maine, the apple maggot preferred the softer fall varieties, but was capable of developing in hard winter ones; and it has lost meanwhile neither the preference nor the capability. The apple maggot has of late changed its generic name, but since the transformation has not entered into the nature of the pest, the same things which were true for *Trypeta pomonella* still hold for *Rhagoletis pomonella.*

DESCRIPTION.

Egg.

The light yellow eggs are fusiform and about four times as long as broad, measuring in length from .8 to .9 mm. and in breadth about .2 mm. At the end left nearest the surface of the apple, the egg has a little stalk or pedicel. The ovaries fill most of the abdominal cavity of the female fly. Each side contains twenty-four chains of eggs, each chain having at least seven eggs in different stages of development.

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* Report this station for 1889, pp. 190-241.

Larva.

The footless maggot is opaque whitish, with a greenish or more often a yellowish tint. It measures from 7 to 8 mm. in length and is 2 mm. or slghtly less in breadth. The body is composed of fourteen segments, the ninth, tenth and eleventh being the thickest. From the ninth segment the body slopes anteriorly to the pointed retractile head segments. The posterior end is much broader than the anterior and is squarely cut off.

The head end is easily distinguished both on account of its pointed shape and the presence of the dark chitinous jaws, which are hook shaped and serve to dig the tunnels and soften the pulp about the larva. The three anterior segments may be retracted, hiding the hooks. See Fig. 31.

The tracheal system is well developed. Anteriorly there are two ventrodorsal tubercles between the third and fourth segments, the cephalic spiracles. Leading from each of these to a caudal spiracle on the fourteenth segment is a lateral tracheal tube. Between the fourth and fifth segments and the eleventh and twelfth segments, the lateral tracheæ are connected by branch tubes.

Pupa.

In this stage the insect is pale yellowish brown in color and oval in shape. It measures about 4.2 to 5.2 mm. in length and is about half as broad. The pupa remains within the larval skin, which becomes thicker and darker. The pupæ are variable in size, the larger ones being quite possibly the females. Fig. 32.

Fly (female).

The adult female is about 5.8 mm. in length with a wing expanse of 12.15 mm. The head is light brown or pale rusty red. The prominent eyes are green with reddish and steel-blue reflections. The antennae are three jointed, the proximal joint being shortest; the second having numerous short thick black bristles on the inner face; and the distal joint long, rounded at the tip. The mouth parts are pale yellow. The thorax is black, striped with silverv longitudinal lines, and marked with a dorsal white spot. The wings are broad and clear at the base. Four dark cross bands traverse each wing. The margin of the wing is armed with bristles. The legs are yellowish and black, and the feet are clothed with dark hairs. The abdomen is composed of seven segments, black as to ground color and striped with four white transverse bands. The seventh segment is blunt when the sheath and ovipositor are retracted, but sloping when the sheath is protruded. The ovipositor is brownish, hornlike above, and bears a median groove below which is covered by two flaps, from beneath which the eggs escape. The ovipositor is sharply pointed and somewhat curved at the end. Fig. 30.

Fly (male).

The adult male is smaller than the female, but of the same general color. The abdomen is composed of but five segments and has only three white bands upon it.

LIFE HISTORY.

The flies, a little smaller than the house-fly and readily distinguished by four dark irregular bands across the wings, are found in the apple orchards from about July first until frost. During this time the females are employed laying eggs, by piercing the skin of the apple with a sting-like ovipositor and leaving at each incision one egg buried in the pulp. Each female is capable of laying at least three or four hundred eggs.

From the eggs hatch apple maggots which tunnel through the pulp where they feed until full grown. Often their tunnels lie directly beneath the skin of the apple, showing through in the light colored varieties as dark trailing tracks which have won for the apple maggot the popular name of Railroad Worm. (See fig. 28). But, though the maggot frequently comes near the surface of the apple, it never breaks through the skin and is thus always protected, a circumstance which shows clearly that it is of no use to try to destroy this pest by spraying.

When the eggs are laid, the apples are young and hard and for some time the maggots grow very slowly. At this stage the tunnels are very inconspicuous and the maggots themselves are not likely to be detected except by careful search. As the apple matures, the maggot makes more and more headway and is frequently full grown by the time the apple is ripe. Moreover the presence of the maggots seem to hasten the development of the apples and much of the infested fruit comes to the ground as windfalls. This is the reason so much stress is laid on the destruction of windfalls to get rid of the maggot.

Since the flies are so long on the wing and lay their eggs over such an extended time, the full grown maggots are found at different periods. The first eggs are laid naturally in the early fruit and accordingly as soon as August tenth full grown maggots have been recorded in Early Harvests. On the other hand, some of the later maggots, from eggs laid in harder winter varieties, do not acquire their full size until late in the fall or winter. These are the maggots that are stored with the fruit.

So far as has been observed the maggots are never mature enough to leave the apples before the fruit falls, but the full grown maggots (shown in fig. 31) bore out of the windfalls and bury themselves an inch or less in the ground. Or, if they are in gathered fruit where they cannot find a suitable burying ground, they creep away beneath some protecting object instead. Soon after leaving the apple (sometimes the transformation takes place within the apple but not often) the maggots shrink a little in length and bulge a little in thickness, the skin at the same time growing tougher and slightly darker.

The insect is known in this form (fig. 32) as the pupa, and rests in this stage all winter. With the return of summer a second transformation takes place which is complete when a fly (fig. 30) with banded wings breaks out of the tough skin which has covered the pupa all winter and comes from its hiding place to seek an orchard where it may spend its life laying eggs in the pulp of young apples.

PREVENTATIVE MEASURES.

As pointed out here, it is useless to try to poison the growing maggots as they are within and protected by the apple. It is also evident that if the maggots contained in windfalls and picked fruit are destroyed one year there will be no trouble to fear from them the next. Of course it is highly improbable that even by the greatest vigilance, every maggot could be thus destroyed. But when it is considered that each maggot left to its own devices has a chance of becoming a fly capable of laying at least three hundred eggs, and that each maggot undestroyed this year may mean three or four hundred next year, the importance of killing as many as possible is evident. If the apple maggots, as do many insects, all developed about the same time, the problem would be much simpler, but as full grown maggots are found in apples from before the middle of August until into the winter, the watch for them must extend over several months.

If enough hogs or sheep to eat the windfalls are kept under infested trees from the second week in August until the fruit is finally gathered, all the maggots in windfalls will be got rid of. Of course the same results, as far as destroying the maggot is concerned, can be obtained by having windfalls faithfully gathered during this time and fed to stock, or made into cider. In some localities the entire orchard will be involved and the task will be a hard and wearisome one, but in many places, where only a few trees are infested, the maggots can be destroyed with comparatively little labor.

Many maggots may be found in fruit at canning time. Here the housewife can help the orchardist by burning infested refuse or killing the maggots with boiling water. Where chickens are kept, the parings can be thrown to them, for they will see that no creeping thing escapes.

Stored fruit remains to be considered. If this is kept in closed boxes or barrels the maggots cannot escape, but will stay in the bottom and enter the pupa state there. As each box is emptied of the fruit, the litter at the bottom in which the little brownish pupæ remain should be carefully poured out and burned.

Another question is, what is to be done with infested fruit on the market? Growers and wholesale dealers can do much to prevent increase of the apple maggot by destroying fruit too much infested to be sold or by giving it to some one with stock. Dealers will not appreciate the danger so much as growers themselves and it would doubtless pay orchardists to explain to dealers in their vicinity the danger from infested fruit and to make some arrangement for disposing of it.

With the home-grown maggots put out of the way, we have still to consider the immigrants coming from other states. Badly infested fruit is imported. It would seem to be well worth while for the State of Maine to prevent this by enacting a law, prohibiting importation of infested apples, with an appropriation sufficient to insure at each entrance port the inspection of imported fruit, at least of the early varieties from which most is to be feared.

The fight against the apple maggot, while exceedingly tedious, is not more difficult than that against many other insect pests. It is useless to wait for simpler or easier methods. Sprays may reach the codling moth before the larva enters the fruit, but the apple maggot is inside the fruit from the very beginning and is safe from poisons. Again, after the maggot buries itself in the ground it is practically safe, as there is great difficulty in fighting under ground insects. But there is a chance to kill it in the fallen fruit and it must be attacked, if at all, at this its one vulnerable point. The way once made plain, the situation is in the hands of the fruit growers, so far as home orchards are concerned, and in the hands of the State as regards imported fruit.

Since this method of destroying the apple maggot was recommended, some ten or twelve years ago, it has been tried in different parts of the State. In this connection it is interesting to note what a few of the fruit growers of Maine have to say from their experience.

One fruit grower in Androscoggin county who keeps hogs or sheep under most of his trees and picks up the rest of the windfalls, met with a loss from the apple maggot this year of about one per cent of his crop. Another in the same county has picked windfalls carefully and states that the trouble from the apple maggot has decreased the past two years, and he experienced no loss from the pest this year. A third man in Androscoggin county says that he does nothing whatever to prevent the ravages of this pest and reports this present year a considerable loss from the apple maggot. He does not pick up his windfalls, nor does he pasture sheep or hogs in his orchard.

From Cumberland county one orchardist reports less injury for the past two years and thinks it is the result, to a great extent if not entirely, of having the windfalls taken care of as soon as they fall from the tree. He pastures with hogs, sheep, geese, and hens. Another orchard owner in the same county does not keep sheep or hogs under his trees and does not pick up his windfalls. He reports the loss of about one-fifth of his crop this year. He states his belief that hogs or sheep enough to take care of the windfalls would prevent the ravages.

One fruit grower in Franklin county who pastures sheep in his orchard and another who keeps hogs under his trees both state that their loss has been very small this year.

A Kennebec county orchardist says the last few years the apple maggot has not been so bad. He pastures sheep in part of the orchard and keeps his apples picked up. A second man from Kennebec county picks up his windfalls and reports that there has been no loss this present year with him.

An orchardist from Sagadahoc county states that he picks up the windfalls and that ravages are decreasing. This year he met with no loss from the pest.

From Lincoln county one fruit grower states that there was no money loss from the apple maggot with him this year. He gathers his windfalls every day. A second man from Lincoln county who keeps hogs under his trees says the maggots did less injury this year than any other year since they first appeared.

Of two Penobscot fruit growers who do not take care of their windfalls, one reports a great loss from the maggot and the other a loss of five per cent of his crop. A third man from the same county picks up his windfalls as soon as they fall. This year he had hardly any loss.

An apple grower in Somerset county says that the apple maggot is not increasing as fast with him as in many places and thinks sheep running under the trees keep the pest down to a great extent.

From Washington county a report comes from an orchardist who has not seen any maggots this year, nor can he find on inquiry any one who has. He gathers his windfalls every day and says it is the common practice in that vicinity to gather windfalls carefully and feed them. Several keep hogs in the orchard.

An apple grower in Aroostook county says he has never seen any maggots in apples grown there.

An orchardist in Piscataquis county says the maggot seemed to increase the last four or five years until this year when he met with practically no loss. He keeps the windfalls from early varieties carefully picked.

With one exception all the fruit growers just quoted feed the refuse from stored apples to stock or to poultry.

Besides the foregoing specific statements it remains to be said that some orchardists who have not made a practice of caring for their windfalls have met with but slight loss from the maggot this year. The question naturally arises, are they feeling the influence of neighboring orchards which are tended?

On the other hand, a few apple growers say they have put the fallen fruit out of the way and yet do not find the trouble decreasing. One of these, however, makes the suggestive remark that the windfalls in neighboring orchards are left on the ground.

It is impossible to ascertain the exact effect, if any, of climatic conditions upon the question. Even if it were possible, the knowledge would probably not prove helpful, for there could be no control of natural climatic conditions on a scale sufficiently large to control this pest.

All things considered, it seems perfectly justifiable to conclude that those orchardists from all parts of the State who have said —"We destroy the windfalls and the trouble is decreasing with us"—have answered their own question as to what shall be done with the apple maggot.

From many counties the reports concerning the varieties damaged came in general terms, indicating that nearly all sweet fall apples and mild sour ones are troubled more than the hard winter fruit.

Although the lists on pages 177 and 178 are not at all complete, perhaps they will not be altogether devoid of interest. They indicate that while in some orchards even the most susceptible varieties may escape infestation, the maggot is capable of adapting itself to most kinds of apples and that there is no certainty that any variety is safe until the orchardist is sure that hundreds of maggots are not burying themselves in his orchard every fall.

The plate facing this page shows, in figure 28, apples with characteristic larval trails which give rise to the popular name, "railroad worm." Figure 29 shows, in cross section of apples, the advanced work of the maggots. Figures 30, 31, 32, represent three stages of the apple maggot—the fly, the larva, and the pupa, all enlarged.

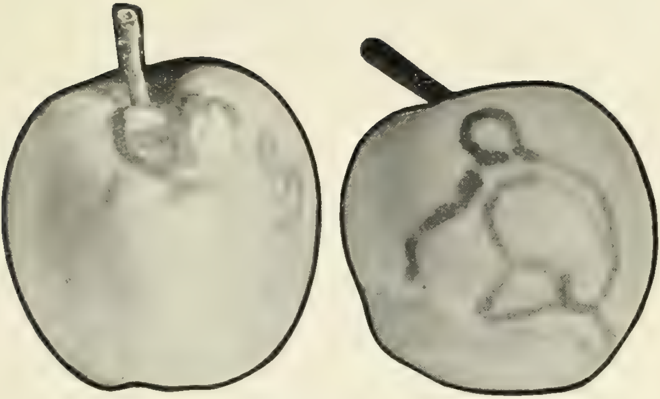


Fig. 28.

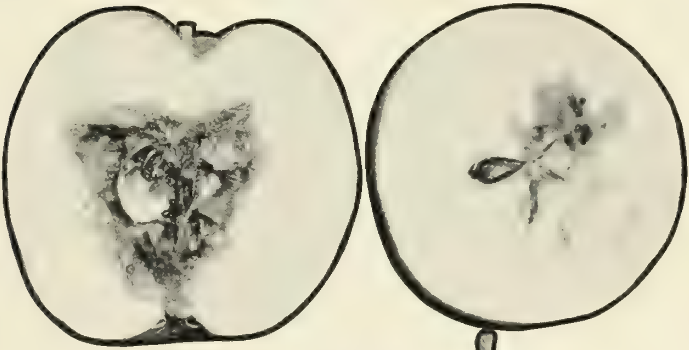
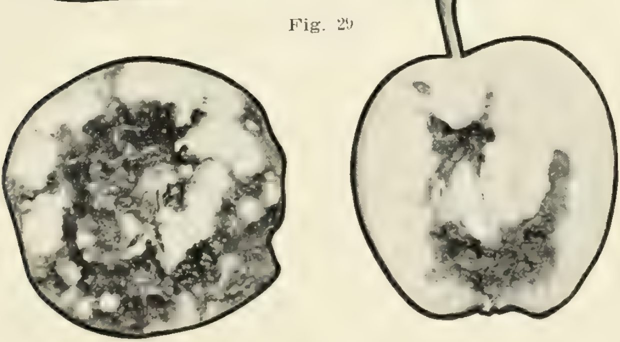


Fig. 29



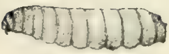


Fig. 31.

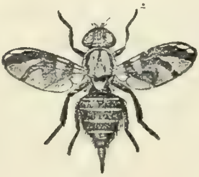


Fig. 30.

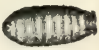


Fig. 32.

The apple maggot and its work.

APPLES REPORTED TO HAVE BEEN INFESTED BY THE APPLE MAGGOT.

A * against the county indicates that the variety named has been badly infested in that locality.

Variety.	County.
1. August Sweet	Oxford*.
2. Bailey Sweet	Cumberland.
3. Baldwin	Penobscot*, Androscoggin, Franklin.
4. Bellflower	Kennebec, Androscoggin.
5. Deane	Piscataquis, Lincoln*.
6. Duchess (Oldenburg)	Lincoln*.
7. Early Harvest	Franklin*, Cumberland, Androscoggin.
8. Fameuse	Piscataquis, Lincoln, Franklin, Penobscot*, Kennebec, Oxford*, Cumberland, Androscoggin*.
9. Foundling	Lincoln*.
10. Franklin Sweet	Kennebec.
11. Gravenstein	Penobscot, Androscoggin, Lincoln, Kennebec, Oxford, Cumberland.
12. Granite Beauty	Lincoln.
13. Garden Royal	Somerset, Lincoln*, Franklin, Cumberland.
14. Garden Sweet	Kennebec*.
15. Golden Sweet	Cumberland.
16. Haskell Sweet	Sagadahoc.
17. Harvey	Franklin, Oxford, Androscoggin.
18. Hightop Sweet	Sagadahoc.
19. Hubbardston	Sagadahoc.
20. Hurlbut	Lincoln.
21. Jewett's Red (Nodhead)	Lincoln, Sagadahoc*, Oxford, Piscataquis, Penobscot*, Kennebec*, Franklin, Cumberland.
22. King (Tompkins)	Kennebec, Penobscot*.
23. Kings Graft	Lincoln*.
24. King Sweet	Somerset*, Lincoln*, Kennebec*, Cumberland.
25. Ladies Sweet	Cumberland.
26. McIntosh	Penobscot *, Lincoln*, Oxford.
27. Milding	Lincoln, Franklin*.
28. Minister	Sagadahoc.
29. Moody	Androscoggin.*.
30. Munson Sweet	Lincoln*, Cumberland*.
31. Northren Spy	Kennebec, Sagadahoc*, Lincoln, Somerset, Androscoggin, Oxford*, Franklin.
32. New York Pippin	Kennebec.
33. Orange Sweet	Lincoln*.
34. Peach	Cumberland.
35. Pearmain (Summer)	Kennebec*, Cumberland.
36. Porter	Kennebec, Sagadahoc, Franklin*, Cumberland, Androscoggin*.
37. Pound Sweet	Cumberland.
38. President	Androscoggin.
39. Primate	Kennebec*.
40. Pumpkin Sweet	Cumberland.
41. Red Astrachan	Kennebec, Androscoggin, Cumberland, Sagadahoc, Piscataquis.
42. Ribstone	Penobscot.
43. R. I. Greening	Androscoggin, Oxford.
44. Rolfe	Piscataquis, Somerset, Penobscot*.
45. Sherwood Favorite	Cumberland.
46. Spice Sweet	Kennebec.
47. Spitzenburg	Oxford.
48. Sops of Wine	Cumberland.
49. Superb Sweet	Androscoggin.
50. Sweet Bough	Kennebec*, Oxford*, Cumberland*, Androscoggin.
51. Tallman Sweet	Sagadahoc*, Kennebec*, Somerset, Penobscot, Lincoln*, Androscoggin, Franklin, Oxford*, Cumberland*.
52. Twenty Ounce	Lincoln, Somerset, Kennebec, Cumberland.
53. Wealthy	Penobscot, Lincoln,
54. Winthrop Greening	Kennebec.
55. Williams Favorite	Cumberland.
56. Yellow Transparent	Cumberland.
57. Benoni	Cumberland.

FRUIT REPORTED TO BE FREE FROM THE APPLE MAGGOT, OR ONLY SLIGHTLY ATTACKED, IN SOME ORCHARDS IN THE COUNTIES NAMED.

Variety.	County.
Baldwin	Cumberland, Piscataquis, Sagadahoc, Penobscot, Oxford, Androscoggin, Franklin, Kennebec, Lincoln.
Beauty of Kent	Lincoln.
Ben Davis	Penobscot, Oxford, Lincoln, Kennebec, Somerset, Androscoggin, Franklin.
Benton Red	Penobscot.
Bellflower	Sagadahoc, Cumberland, Androscoggin, Kennebec, Oxford, Somerset, Lincoln.
Black Oxford	Sagadahoc, Penobscot, Androscoggin, Lincoln, Kennebec.
Blue Pearmain	Lincoln.
Danvers Winter Sweet	Lincoln.
English Russett	Lincoln.
Fallawater	Piscataquis.
Gano	Kennebec.
Gravenstein	Lincoln.
Grimes Golden	Lincoln.
Haas	Penobscot, Lincoln.
Harvey	Sagadahoc, Kennebec.
Hubbardston	Androscoggin, Kennebec.
Hunt Russett	Lincoln.
Jewett's Red (Nodhead)	Kennebec, Oxford.
King (Tompkins)	Piscataquis, Sagadahoc, Cumberland, Kennebec, Oxford.
Ladies Sweet	Lincoln.
Maiden Blush	Androscoggin.
Mann	Somerset, Penobscot.
McIntosh Red	Oxford, Androscoggin.
Milding	Piscataquis, Lincoln.
Newtown Pippin	Lincoln.
Northern Spy	Piscataquis, Penobscot, Kennebec.
Porter	Lincoln, Kennebec.
Red Astrachan	Kennebec, Somerset.
Red Canada	Kennebec.
Red Russett	Kennebec.
Rhode Island Greening	Piscataquis, Sagadahoc, Penobscot, Kennebec, Androscoggin, Lincoln, Somerset, Cumberland, Oxford.
Rolfe	Androscoggin.
Roxbury Russett	Kennebec, Somerset.
Russett	Sagadahoc, Penobscot, Androscoggin, Oxford, Lincoln, Kennebec, Franklin.
Spitzenburg	Sagadahoc, Lincoln, Somerset.
Stark	Piscataquis, Penobscot, Franklin, Kennebec, Lincoln, Somerset.
Starkey	Lincoln.
Tallman Sweet	Lincoln.
Wagener	Penobscot, Androscoggin, Lincoln.
Wealthy	Sagadahoc.
Westfield (Seek-no-Further)	Androscoggin.

INSECT NOTES FOR 1904.

Edith M. Patch.

The situation for this year is marked especially by an immigration of brown-tail moths, *Euproctis chrysorrhœa*, to the southern part of the State in July; the reappearance of the white-marked tussock moth, *Notolophus leucostigma*, in the shade trees of Portland; the occurrence of the red-humped caterpillar, *Œdemasia concinna*, in all parts of the State; a conspicuous outbreak of the cottony grass-scale, *Eriopeltis festucæ*, in many localities; and a general infestation of aphids.

Just the right conditions (whatever they may be) have existed for aphids this summer. From April to November black alders have been white stemmed with *Schizoneura tessellata* as shown in fig. 33. About the middle of July the maples along the Penobscot were clustered thick upon leaves and leaf stems with aphids of the same genus, and the river two miles above Old Town had a milky white cast caused by the bodies and molts. In June whole hillsides were sticky with honey dew, the coniferous trees present being covered with aphids which for the most part belonged to the genus *Lachnus*. The leaves of apple, elm highbush cranberry, snowball, and currant are among those which were especially attacked. *Chermes pinicorticis* was conspicuous in some localities on white pine. Perhaps the most interesting of the gall producing aphids present is a species of Chermes which is distorting the branches of the Norway and red spruces in eastern Maine. The open cone-like gall of this aphis is shown in fig. 34.

As would be expected, numbers of insects were attendant upon the aphis colonies. Five species of fireflys, *Lampyridæ*, were common upon infested bushes in June; the first of July lace-winged flies, *Chrysopidæ*, were shyly darting about the woods while their progeny of aphis lions were ravaging colonies of plant lice; all through the season striped syrphus flies (fig. 37) could be seen hovering about and their larvæ (fig. 36) could be found everywhere waxing fat in aphis clusters; the lady beetles were not so numerous as might be wished, though eight species were taken at Orono in May and June. Of the insects which were attracted by the honey dew, ants were present in the usual numbers; and in August three species of yellow jackets were very numerous about the leaves and upon the ground under those species of aphids which secreted most honey dew.

The larvæ of a drone fly, *Eristalis tenax,* is never found without arousing curiosity. Fig. 46 will show why it is called the rat-tailed larva. This maggot lives in such places as cesspools, and the "tail" is really an extended breathing tube the tip of which the insect elevates into the air and is so able to breathe, although the rest of its body is buried in fluid matter. The adult insect frequents flowers.

The willow cone gall, shown in fig. 43, is another common object concerning which questions are often asked. This gall is caused by a gnat, *Cecidomyia strobiloides,* about the size of a mosquito, which deposits an egg in the willow buds early in the spring. The subsequent growth of the willow leaves is abnormal and they cluster into a close cone-like object, in the heart of which is a larvel cell (fig. 42) containing the yellowish pink maggot. Here the insect passes the winter, and the adult gnat emerges at the time the willows are budding, about the middle of May here in Orono.

Robber flies, *Asilidæ,* are frequently brought to the station, their queer shape or peculiar manner attracting attention. Two were found this summer preying upon the cabbage butterfly, *Pieris rapæ,* (see fig. 39) and their rapacious appetite leads to the destruction of many insects, the honey bee among them, a fact not enjoyed by bee keepers.

Among the most important natural factors in helping to keep injurious insects within bounds are the ichneumon flies. Although the various species differ in size and color, fig. 38 will serve to illustrate the characteristic form of many of these beneficial insects.

The slow-flying Pelecinus, fig. 35, has been common enough to cause considerable inquiry. No detailed studies have been recorded, but it is reported to be parasitic upon the white grub, fig. 45, the young May beetle, fig. 44.

Other insects important in the economy of nature are the numerous carrion beetles that dispose of decaying flesh which they find in fields and woods. Fig. 41 represents one large genus, *Silpha,* of these scavengers.

The beautiful maple borer, *Plaginotus speciosus*, fig. 40, was received from Monmouth the middle of July. The insect lays its eggs about this time in the bark of hard maples and the larvæ bore into the wood. Their presence is made known in the spring by the dust that is pushed from their tunnels, and the borers can be destroyed by a knife and a wire, as in the case of the apple tree borers.

During the year a number of insects have been received from correspondents for identification. A list of these with notes is given in the following table. In addition to these, a few other animals have been received and examined. These include: Nematode worms, from salt cod fish. The flesh bordering the alimentary canal was filled with encysted worms, which were more than an inch in length. Millipedes. Numerous in a cucumber house at York Corner, where they spoiled most of the cucumbers. Trap door spider, *Theraphosidæ*. Received from Levant, though evidently a southern species.

INSECTS RECEIVED FOR IDENTIFICATION.

Name.	Date.	Host.	Locality.	Remarks.
Cecropia moth, *Samia cecropia*	March 20	Apple	Madison	Cocoon, "only one seen."
Cecropia moth, *Samia cecropia*	March 29	Apple	Kittery	Cocoon, only one seen in orchard.
Cecropia moth, *Samia cecropia*	April 1	Apple	Caribou	Cocoon, four on one tree "not seen before."
Cecropia moth, *Samia cecropia*	May 9	Apple	South Presque Isle	Cocoon, "only one found."
Promethea moth, *Callosamia promethea*	March 30	Wild cherry and barberry	Kittery	Cocoon numerous, mostly parasited.
Old tussock moth, *Notolophus antiqua*	June 14	Apple	Lewiston	Larvæ.
Old tussock moth, *Notolophus antiqua*	March 29	Apple	Kittery	Egg clusters.
Old tussock moth, *Notolophus antiqua*	Oct. 18	Apple	South Paris	Larva.
White-marked tussock moth, *Notolophus leucostigma*	March 29	Apple	Kittery	Egg clusters.
White-marked tussock moth, *Notolophus leucostigma*	Aug. 18	Elm	Portland	Cocoons. Shade trees badly infested.
White-marked tussock moth, *Notolophus leucostigma*	April 26	Apple	Orono	Egg clusters.
Well-marked tussock moth, *Notolophus definita*	Aug. 4	Dogwood	Orono	Larvæ nearly grown.
Brown-tail moth, *Euproctis chrysorrhœa*	March 30	Pear	Kittery	Winter nests, common.
Brown-tail moth, *Euproctis chrysorrhœa*	Aug. 22	Pear	Kittery	Young colonies, numerous.
Lesser apple leaf folder, *Teras minuta*	June 3	Apple	Skowhegan	Larvæ.
Fall web worm, *Hyphantria cunea*	Aug. 4	Apple	Albion	Larvæ.
Fall web worm, *Hyphantria cunea*	Aug. 29	Apple	Eliot	Larvæ.
Fall web worm, *Hyphantria cunea*	Sept. 2	Apple	Foxcroft	Larval molts.
——*Ctenucha virginica*	June 9	Grasses		Cocoon found in apple tree.
——*Ctenucha virginica*	June 20	Grasses	Farmington	Two cocoons, one was parasited.
——*Lycomorpha pholus*	Aug. 19	Lichens	Sebago Lake	One moth.
Cut worm, *Feltia subgothica*	Aug. 10		East Sangerville	Moths common.
Chain-streak moth, *Cingilia catenaria*	Sept. 22		Orono	Moths common.
Great tiger moth, *Arctia caia*	July 28		Orono	Moth.
Isabella tiger moth, *Pyrrharctia isabella*	July 14		Orono	Moth.
Handmaid moth, *Datana ministra*	Aug. 12	Apple	East Bangor	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Aug. 12	Apple	Skowhegan	Larvæ, "many in orchard."
Red-humped caterpillar, *Oedemasia concinna*	Aug. 27	Apple	Dexter	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Aug. 29	Apple	Eliot	Larvæ, all parasited.
Red-humped caterpillar, *Oedemasia concinna*	Aug. 4	Apple	Turner	Larvæ.

Red humped caterpillar, *Oedemasia concinna*	Aug.	12	Apple	Wiscasset	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Aug.	18	Apple	Sebago Lake	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Aug.	22	Apple	Kittery	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Sept.	2	Apple	Farmington	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Sept.	8	Apple	Skowhegan	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Sept.	9	Apple	South Ampton, L. I.	Larvæ.
Red-humped caterpillar, *Oedemasia concinna*	Oct.	3	Apple	Orono	Larvæ and cocoons.
Glassy cut worm, *Hadena devastatrix*	July	20		Foxcroft	Moth.
Cut worms, ———	Aug.	4		Seal Harbor	Larvæ.
Clear-wing moth, *Sesiidae*	July	7	Rose	Hulls Cove	Larvæ.
Achemon sphinx, *Philampelus achemon*	Sept.	5	Apple	Farmington	Larvæ full grown.
Blind-eyed sphinx, *Paonias excæcatus*	Sept.	9	Apple	Houlton	Larvæ full grown.
Mourning-cloak, ***Euvanessa antiopa***	July	28	Willow	Portland	Larvæ molts.
——— *Grapta faunus*	Aug.	10	Willow	East Sangerville.	Butterfly.
Cottony grass scale, *Eriopeltis festucae*	April	6	Grass	Sedgwick	Egg sacs in meadow, numerous.
Cottony grass scale, *Eriopeltis festucae*	July	20	Grass	Gorham	Egg sacs, common.
Cottony grass scale, *Eriopeltis festucae*	July	28	Grass	Dresden	Egg sacs, ground covered.
Cottony grass scale, *Eriopeltis festucae*	July	28	Grass	Eggemoggin	Egg sacs, thick on stalks.
Cottony grass scale, *Eriopeltis festucae*	Aug.	3	Grass	Orono	Egg sacs, not common.
Cottony grass scale, *Eriopeltis festucae*	Aug.	4	Grass	Portland	Egg sacs, badly infested.
Cottony grass scale, *Eriopeltis festucae*	Aug.	6	Grass	Manchester	Egg sacs, infestation bad.
Plant louse, *Aphis Sp.* (?)	Aug.	29	Rose	Sagadahoc	
Green apple aphis, *Aphis mali*	Jan.	25	Apple		Eggs near leaf-scar on twig.
Green apple aphis, *Aphis mali*	June	26	Apple	Dover	
Green apple aphis, *Aphis mali*	Aug.	29	Apple	South Smithfield	On grafts.
Plant louse aphis, *Aphis Sp.*	June	20	High bush cranberry	Seal Harbor	Leaves curled. Syrphus fly larvæ present.
Honey-dew on leaves	June	21		Abbot	"Nearly everything covered for miles."
Potato aphis, *Aphis Sp*	Aug.	12	Potato	Houlton	Common.
Alder blight, *Schizoneura tessellata*	April	26	Alder	Orono	Larval clusters common.
Woolly elm aphis, *Schizoneura americana*	June	11	Elm	Brunswick	In curled leaves which serve as a protection.
Woolly louse of the apple, *Schizoneura lanigera*	July	31	Apple	Gorham	In crevice on tree trunk.
——— *Lachnus* (*abietis* probably)	June	10	Fir	Augusta	Giant dark aphids. Wingless form eggs near leaf scars on twigs.
Spruce gall aphis, *Chermes*——— ?	June	23	Spruce	Orono	Galls common on Norway spruce.
Oyster shell scale, *Mytilaspis pomorum*	Aug.	11	Apple	Portland	Twigs badly incrusted.
Leaf hoppers——— ?	June	25	Apple	West Falmouth	Larvæ.

INSECTS RECEIVED FOR IDENTIFICATION—CONCLUDED.

Name.	Date.		Host.	Locality.	Remarks.
Tarnished plant bug, *Lygus pratensis*	Sept.	13	Asters	Ellsworth	Larvæ and adults.
Black damsel bug, *Coriscus subcoleoptratus*	July	14		Orono	Larvæ, short winged.
Fleas——				South Freeport	Troublesome in poultry houses.
Hair lice, *Trichodectes*——					Troublesome on horses and cattle.
Croton bugs, *Blatta germanica*				Corinth	"A great pest about the house."
Lace-winged fly, *Chrysopa*	July	20	Aphids	Orono	Eggs on alder leaf.
Syrphus fly, *Syrphus*——	July	7	Aphids	Orono	Larvæ common among *Schizoneura tessellata*.
Robber fly, *Asiladæ*	July	23		Old Town	Caught preying upon cabbage butterfly.
Rat-tailed larva, *Eristalis tenax*	Sept.	28			Two pupal molts from stable floor
Pigeon horn-tail, *Tremex columba*	Aug.	10		Waterville	Female.
Cockoo fly, *Chrysididæ*	June	21		Orono	Female.
——*Pelecinus polyturator*	Aug.	10		Orono	Female.
Ichneumon fly, *Thalessa lunata*	July	30		Orono	Female.
Strawberry crown girdler, *Otiorhynchus ovatus*	Aug.	8		Maysville Center	About edge of carpet.
Strawberry crown girdler, *Otiorhynchus ovatus*	Aug.	13		Monson	"House full of them."
Strawberry crown girdler, *Otiorhynchus ovatus*	Aug.	17	Grass roots?	Houlton	Numerous in meadow.
Two-spotted lady beetle, *Adalia bipunctata*	Sept.	17	Aphids	Hallowell	Pupæ and adults on birch leaves.
Lady beetle——	June	28	Aphids	Bar Harbor	Larvæ on rose bush.
Herbivorous lady beetle, *Epilachna borealis*	July	6		Auburn	Cluster of larvæ molting on bark of plum tree.
Larder beetle, *Dermestes lardarius*	May	23		Orono	Adults in woodbox.
Larder beetle, *Dermestes lardarius*	June	20		Rangeley	Great numbers in cottage where rats and mice had been poisoned the fall before.
——*Silvanus surinamensis*	Jan.	7	Corn flour	Orono	700-800 adult beetles in ⅔ quart flour.
Beautiful maple borer, *Plaginotus speciosus*	July	15		Monmouth	Adult.
Carrion beetle, *Silpha americana*	May	13		Orono	
Rove beetle, *Staphylinidæ*	Aug.	1		Dresden	On mushroom.
——*Ips fasciatus*	Aug.	17		Portland	Beetles common in meadow.
Three spotted doryphora, *Doryphora clivicollis*	Aug.	22	Milkweed	Kittery	Larvæ and adults.
Asparagus beetle, *Crioceris asparagi*	June	15	Asparagus	Orono	Adults common in garden.

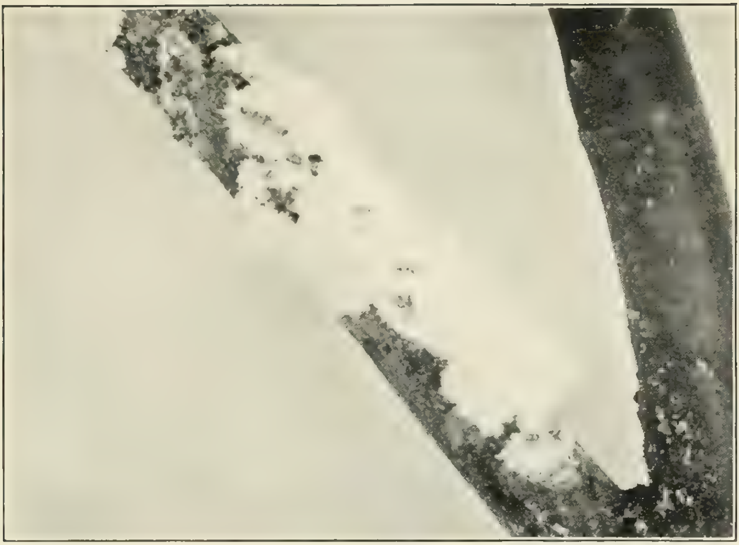


Fig. 33.
Black alder infested with alder blight, *Schizoneura tessellata.*

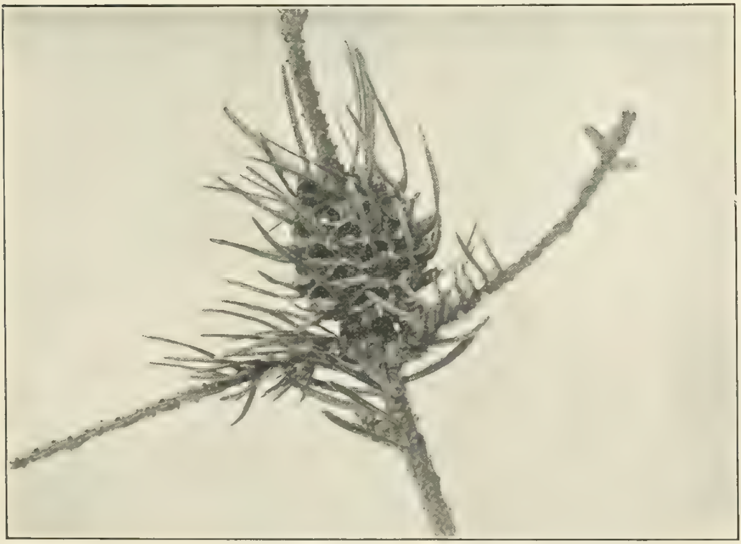


Fig. 34.
Cone-like gall of aphis common on the Norway and red spruces in eastern Maine.

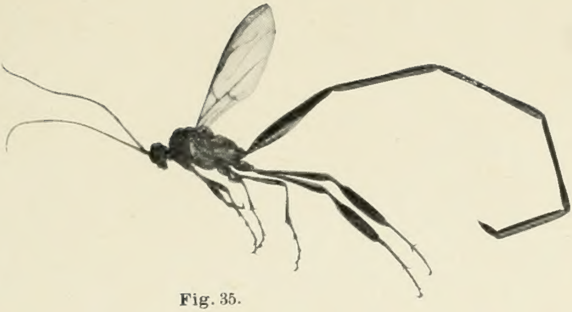


Fig. 35.

Fig. 36.

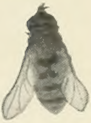


Fig. 37.

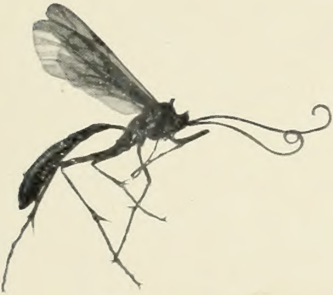


Fig. 38.

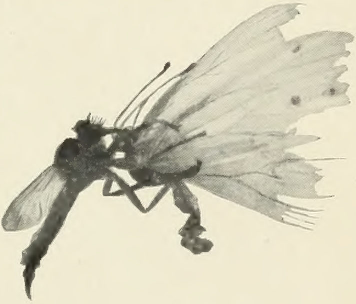


Fig. 39.

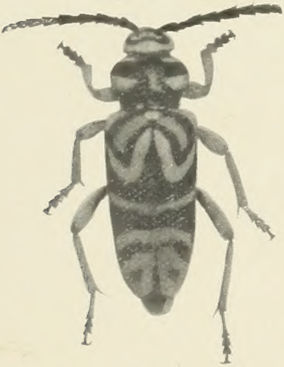


Fig. 40.

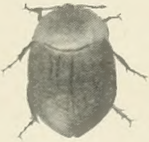


Fig. 41.

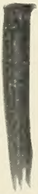


Fig. 42.

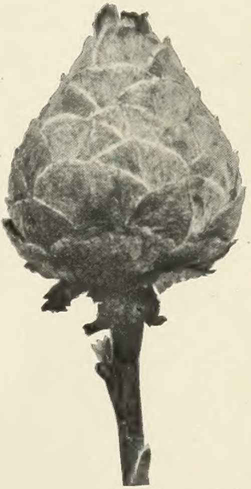


Fig. 43.

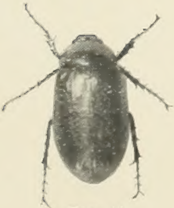


Fig. 44.

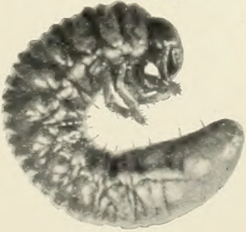


Fig. 45

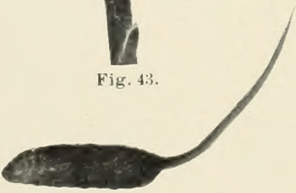


Fig. 46.

Insects referred to on pages 179 to 181.